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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,332	06/23/2003	Cheol Hwan Park	P68917US0	6589
136	7590	07/28/2004	EXAMINER	
JACOBSON HOLMAN PLLC 400 SEVENTH STREET N.W. SUITE 600 WASHINGTON, DC 20004			ISAAC, STANETTA D	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 07/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/600,332	PARK ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Stanetta D. Isaac	2812	<i>Am</i>

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 23 June 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) 12 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.


#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

  
**LYNNE A. GURLEY**  
**PRIMARY PATENT EXAMINER**  
**TC 2800, AU 2812**

#### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

1. This Office Action is in response to the application filed on 06/23/03. Currently, claims 1-12 are pending.

***Election/Restrictions***

2. During a telephone conversation with Allen S. Melser on 07/16/04 a provisional election was made without traverse to prosecute the invention of Group I, the method claims 1-11. Affirmation of this election must be made by applicant in replying to this Office action. Claim 12 is withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 11 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
5. It is indefinite whether the liner nitride film, in claim 11, is an additional liner nitride film to the liner nitride film mentioned in claim 1 or, whether it is the same liner nitride film. If it is the same liner nitride film, then "a liner nitride film" should be changed to "the liner nitride film" in claim 11 line 3 for proper antecedent basis.
6. For examination purposes the examiner has considered that the liner nitride film, in claim 11, is the same as that in claim 1.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-4 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Benedict et al. US Patent 5,763,315.

9. Benedict discloses the semiconductor method as claimed. See figures 1A-2E, and corresponding text, where Benedict teaches a method for forming a device isolation film, comprising the steps of: (a) sequentially forming a pad oxide film 12 and a pad nitride film 14 on a semiconductor substrate 10; (b) selectively etching the pad nitride film to form a nitride film pattern; (figure 1A, col. 2, lines 51-61) (c) etching the pad oxide film and a predetermined thickness of the semiconductor substrate using the nitride film pattern as a hard mask to form a trench 16; (d) forming a thermal oxide film 18 on the surface of the trench; (e) performing an annealing process under  $\text{NH}_3$  atmosphere to form an oxide nitride film on the surface of the thermal oxide film (col. 3, lines 15-24); (f) forming a liner nitride film on the entire surface (col. 3, lines 52-55); (g) forming an oxide film filling 22 the trench on the entire surface; and (h) performing a planarization process (figure 1f, col.3, lines 43-46).

10. Pertaining to claim 2, Benedict teaches the method, wherein the step (e) comprises a plasma  $\text{NH}_3$  nitridation or a thermal  $\text{NH}_3$  nitridation. (Col. 3, lines 15-24)

11. Pertaining to claim 3, Benedict teaches the method, wherein the step (e) is performed at a temperature ranging from 600 to 900°C. (Col. 3, lines 18-20)

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12. Pertaining to claim 4, Benedict teaches the method, wherein the step (e) is performed at a pressure ranging from 5 mTorr to 200 Torr. (Col. 3, lines 15-24)

13. Pertaining to claim 6, Benedict teaches the method, wherein the step (f) is performed in a LPCVD furnace or a LPCVD single chamber. (col. 3, lines 52-54)

***Claim Rejections - 35 USC § 103***

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 5 and 7-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benedict et al. US Patent 5,763,315 in view of Hong US Patent 6,255,194.

16. Benedict discloses the semiconductor method substantially as claimed. See preceding rejection of claims 1-4 and 6, under 35 U.S.C. 102(b).

17. However, Benedict fails to show, pertaining to claim 5, whether the liner nitride formation and annealing steps are performed under in-situ, in-chamber, or in cluster conditions; pertaining to claims 7-10, the method wherein the step (f): is performed at a temperature ranging from 600 to 900°C; with a pressure range from 0.1 to 10 Torr; and in addition, using one or more gases selected from the group consisting of SiH<sub>4</sub>, SiCl<sub>4</sub>, SiH<sub>2</sub>Cl<sub>2</sub>, NH<sub>3</sub>, and N<sub>2</sub>, which are silicon and nitrogen source gases, respectively. Furthermore, Benedict fails to show, pertaining to claim 10, the method wherein the supply ratio of nitrogen source gas to silicon source gas is 1:1~20:1. Finally, Benedict fails to show, pertaining to claim 11, the method wherein the step (f) further

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comprises the step of forming a thermal oxide film on a liner nitride film and performing an annealing process.

18. Hong teaches in figures 1-8 and corresponding text, in a similar trench isolation method using pad oxide and nitride mask, forming a thermal oxide film on a liner nitride film and performing an annealing process. Hong also teaches conventional ranges for temperature, pressure, and selection and ratios of source gas. (Col. 4 lines 52-56, col. 6 lines 15-18)

19. It would have been obvious to one of ordinary skill in the art to have had steps (e) and (f) be performed under in-situ, in-chamber or cluster condition, pertaining to claim 5, in the method of Benedict, with the motivation that, in order to make the process more efficient and to reduce extraneous contamination and exposure to the atmosphere, in-situ techniques would be desirable. Also, as stated in col. 3 lines 50-66, Benedict teaches the use of an LPCVD process and furnace annealing techniques, which are well known in the art to include performance under in-situ, in-chamber or cluster conditions.

20. It would have been obvious to one of ordinary skill in the art to incorporate the claimed ranges with regards to temperature, pressure, and the selection and ratios of source gases, pertaining to claims 7-10, in the method of Benedict, based on the combined teaching of Benedict in view of Hong, with the motivation that both methods are performed under the use of conventional techniques, resulting in the formation of the silicon nitride layer, using a LPCVD process. The claimed ranges are considered to be within conventional specifications, especially since no critically has been shown.

21. It would have been obvious to one of ordinary skill in the art to have incorporated the thermal oxide film on the liner nitride film and then perform an annealing process, pertaining to

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claim 11, in the method of Benedict, according to the teachings of Hong, with the motivation that, as stated in Hong, col. 5, lines 63-67, col. 6, lines 1-45, the second thermal oxide film is used to protect the pad nitride film during a plasma process where it is preferable to perform a thermal process such as a plasma thermal process including  $\text{NH}_3$  on the inner walls before filling the trench in order to control the thermal expansion between the filling material and the semiconductor substrate.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stanetta D. Isaac whose telephone number is 571-272-1671. The examiner can normally be reached on Monday-Friday 9:30am -6:30pm.

23. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on 571-272-1679. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

24. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Stanetta Isaac  
Patent Examiner  
July 25, 2004

  
**LYNNE A. GURLEY**  
**PRIMARY PATENT EXAMINER**  
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